



This document provides a framework for guiding regional actions on urban seismic risk management in the Caribbean. The document was developed based on inputs from experts in the Caribbean during the Regional Urban Seismic Risk Forum held in Haiti from 18-21 September, 2016.

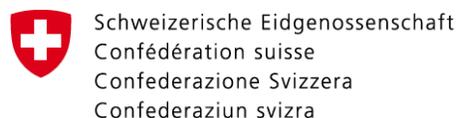
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The following agencies were involved in the organization of the forum:



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Acronyms

African, Caribbean and Pacific	ACP
American Society of Civil Engineers	ASCE
Association of Caribbean States	ACS
Bureau de Recherches Géologiques et Minières	BRGM
Caribbean Application Document (CAD)	CAD
Caribbean Catastrophe Risk Insurance Facility	CCRIF
Caribbean Development Bank	CDB
Caribbean Disaster Emergency Management Agency	CDEMA
Caribbean Regional Organization for Standards and Quality	CROSQ
Caribbean Risk Information System	CRIS
Centro Nacional de Investigaciones Sismológicas	CENAI
Cooperazione Internazionale	COOPI
Council of Caribbean Engineering Organisations	CCEO
Department for International Development	DfID
Department of Foreign Affairs, Trade and Development	DFATD
Directorate of Civil Protection	DPC
Disaster Preparedness Programme of the European Commission's Humanitarian Aid and Civil Protection department	DIPECHO
Disaster Resistant Business	DRB
Disaster Risk Reduction	DRR
European Union	EU
Humanitarian Aid and Civil Protection Department	ECHO
Instituto Nacional de Estadística y Geografía	INEGI
International Building Code	IBC
International Search and Rescue Advisory Group	INSARAG
Institute Physique du Globe de Paris	IPGP
Isabela State University	ISU
Japan International Cooperation Agency	JICA
L'Alliance pour la Gestion des Risques et la Continuité des Activités	AGERCA
Ministry of Public Works, Transport and Communications	MTPTC
National Disaster Office	NDO
National Science Foundation	NSF
Non-governmental Organization	NGO
Office of U.S. Foreign Disaster Assistance	OFDA
Pan American Health Organization	PAHO
Permanent Secretariat of Risk Management and Disasters (Haiti)	SPGRD
Physical and Environmental Planning Sector Sub-Committee	PEPSSC
Regional Technical Working Group	RTWG
Seismic Research Centre	SRC
Statistical Data Management Unit (SDMU)	SDMU

United Nations Development Programme	UNDP
United Nations Office for Disaster Risk Reduction	UNISDR
United States Agency for International Development	USAID
United States Geological Survey	USGS
University of the West Indies	UWI
World Bank	WB
World Health Organization	WHO

Regional Road Map for Urban Seismic Risk Management in the Caribbean

1. Introduction

Among the natural phenomena to which the Caribbean is susceptible, earthquakes rank among the highest in potential to cause the most destruction in one event. They are among the most difficult hazards for which effective loss reduction programmes can be established. Hundreds of earthquakes occur in and around the Caribbean Region each year as a result of the interaction of the Caribbean plate with at least four other plates. In the Caribbean, the Lesser Antilles island arc is located near a subduction zone that can produce earthquakes among the strongest on Earth, as its geological structure allows more stress to build up before energy is released. The seismic potential along the Greater Antilles is fueled by shallow fault structures that run close to several highly populated centres. At close proximity, the earthquake magnitudes do not have to be extreme to generate damaging ground motions, particularly for vulnerable structures.

Significant increases in the overall population numbers and a proliferation of costly infrastructure and housing in urban areas present significant challenges for reducing seismic risk in urban areas. In many instances the quality and siting of the infrastructure and housing contributes to vulnerability of people and infrastructure to seismic risk. Since the turn of the last century the Caribbean has witnessed high rates of urbanization, with eight countries including Jamaica, Trinidad and Tobago and The Bahamas having urban populations above two-thirds of the total population¹. Urbanization in the Caribbean reflects the influences of dependency, globalization, consumption, production, rural-urban migration, urban primacy and employment structure among other effects. Regardless of the causes, increased urbanization with the high population densities and public and private investments make urban areas a priority for disaster risk reduction (DRR) programmes. During the post-independence period neither adequate frameworks nor mechanisms were put in place to prescribe effective earthquake safety programmes. Most Caribbean territories therefore remain vulnerable to seismic risk because:

1. Preparedness levels are insufficient: deficiency in critical awareness of the dangers posed by earthquake hazards leading to paucity of drills, contingency planning and emergency exercises.
2. Scientific knowledge about the regional seismogenic sources need to be improved in order to refine the regional natural hazards maps
3. Poor risk governance
4. Building regulation framework is ineffective; consequently, building codes/standards are not enforced.
5. Natural hazards damage mitigation as part of the planning system is not effectively enforced.
6. Ex-ante risk financing woefully inadequate.

¹ World Bank Little Data Book 2000, UNCHS Human Settlement Indicators 2003

The advancements and recommendations presented through previous seismic risk fora held in the region should all be used in tandem with the recommended actions outlined in this Regional Roadmap noting common areas such as building codes and public awareness and education. These workshops were held in 2012 in the Dominican Republic² with the objective of scientific and technical knowledge exchange as well as tools among disaster risk reduction partners; 2015 in Jamaica³ to present the results CDEMA-led Project that dealt with 1) enhanced readiness for earthquakes and tsunamis and 2) knowledge and awareness of resilience issues; and 2016 in Cuba⁴ where the focus was on exchanges on topics related to geologic risk and seismic and disaster engineering; Common among these initiatives is the focus on knowledge and experience sharing on earthquake risk and impacts. The challenge of risk-informed planning and construction was highlighted along with the need for capacities to be built both formally and informally and increased awareness among decision-makers have also been highlighted.

The initiatives have benchmarked progress on the topic and thus the recommendations from these initiatives have in many instances been integrated into the development of the regional roadmap at the level of the status or actions that still need to be implemented. The necessary next steps that the region should consider along with timelines and funding opportunities to ensure further progress were the focus of deliberations in the 2016 forum in Haiti (Table 1).

2. Aim and objectives of Regional Road Map on Urban Seismic Risk

The main aim of the regional road map on urban seismic risk management is to identify concrete actions that will advance the current status of seismic risk management in the Caribbean, including replication and/or scaling up previous interventions (refer to Table 1). A key question in developing the regional road map is whether seismic risk management has been a priority in urban areas. Advancements resulting from the implementation of this regional road map will contribute to safeguarding livelihoods and property as expressed in the global and regional DRR frameworks. In an effort to strategically address urban seismic risk management, the roadmap will focus on:

1. The status of urban seismic risk management
2. Recommendations for regional level actions
3. Timelines for achievement of regional level actions
4. Funding opportunities for advancing road map

3. Outcomes

It is expected that with the identification of elements such as the recommended next steps, timelines and funding opportunities, partners will be better positioned to advance urban

² http://eird.org/dipecho-action-plan-caribbean/ReporteRiesgoSismico_ENFinal_Sept26.pdf

³ http://cdema.org/index.php?option=com_content&view=article&id=1424:regional-seismic-and-tsunami-risk-workshop&catid=35:press-releases

⁴ <http://cienciastecnicas.eventos.uo.edu.cu/conferencia-sismos/>

seismic risk management in the Caribbean. The road map can be used to guide interventions and cooperation among partners towards seismic risk management in the region.

4. Coordination, Implementation, Monitoring and Reporting

The Regional Roadmap was developed with inputs from national and regional experts and includes actions that should be undertaken by stakeholders across sectors such as research and education, construction, planning, disaster management, among others; across the public sector, private sector and civil society; and at different levels – local to regional. Wide distribution of the regional roadmap will allow for the variety of actors to focus their efforts to achieve progress on urban seismic risk management. Annex 1 provides an indication of the roles that some agencies have identified to ensure the coordination, implementation, monitoring and reporting on the roadmap.

Existing inter-sectoral committees can be used for coordinated planning, implementation and learning in relation to the actions presented in this Roadmap at national level. The advancements made will be captured at national and regional levels through the CDM Audit, the reporting for which is directly coordinated by the CDEMA Coordinating Unit.

From a sectoral perspective at regional level the two most relevant avenues for promoting, monitoring and reporting on the Roadmap are the Regional Technical Working Group (RTWG) and the Physical and Environmental Planning Sector Sub-Committee (PEPSSC) of the CDEMA system. Leadership by the RTWG and PEPSSC of CDEMA on the Regional Roadmap for Urban Seismic Risk Management in the Caribbean will allow for the institutionalization of the Regional Roadmap and provide sustainability towards achieving continued progress on the theme in the Caribbean.

Leadership from CDEMA has been demonstrated in their partnership on the Seismic Risk Forum in Haiti and their strong support for the Roadmap from its initial drafting to its current iteration. It is anticipated that CDEMA will continue to support processes towards the achievement of the objectives of the Roadmap.

5. Regional Priorities for Urban Seismic Risk Management

During the Urban Seismic Risk Forum experts from Haiti and across the Caribbean Region identified next steps towards managing urban seismic risk as presented in Table 1. Further, three priority next steps were identified across the themes of risk governance, understanding urban seismic risk, mitigation and preparedness, response, recovery and reconstruction, public awareness and education, risk finance and transfer and business continuity planning. These priorities are presented below by theme:

Risk governance

- ❖ Development of model legislation, regulation and policy to manage seismic risk and advocate for the adoption at the national level.
- ❖ Leverage the international financial and insurance institutions to incentivize national adoption of normatives.
- ❖ Establishment of Chairs at credible universities within the region to coordinate geohazard/earthquake engineering research specific to the region.

Understanding urban seismic risk

- ❖ Evaluate status and availability of geologic maps for urban seismic risk.
- ❖ Update and maintain a Homogeneous Regional Seismic Catalogue (historical and instrumental)
- ❖ Establish a standard mechanism/methodology for undertaking seismic risk and vulnerability assessments

Mitigation and preparedness

- ❖ Review planning legislation to incorporate Natural Hazard Impact Assessment (NHIA) as a consideration in the development approval process
- ❖ Adopt a modified French model of enforcement for building construction, considering it is a best practice of the region.
- ❖ Require all new investment projects (public and private) to be subject to the application of a seismic study including micro-zonation studies to be conducted for all existing critical infrastructure sites.

Response, recovery and reconstruction

- ❖ Build/establish SAR and specialized Emergency Response capacity including capacity for the conduct of quick assessment or building triaging in the aftermath of seismic events; Teams must be trained and adequately resourced.
- ❖ Promote rehabilitation and reconstruction in-keeping with existing standards and codes as well as promoting seismic retrofitting of existing vulnerable buildings.
- ❖ Establish information sharing platform for dissemination of accurate/reliable information post-seismic events.

Public awareness and education

- ❖ Develop a multi-hazard, multi-pronged public awareness framework for the region, adaptable at the national level, under a regional coordination mechanism (CDMS).
- ❖ Implement the Global School Safety Framework throughout the region with a view to harmonization of approaches to school safety.
- ❖ Develop regulatory framework/standards for vocational and professional training adapted for local communities' needs.

Risk finance and transfer and business continuity planning

- ❖ Identify, assess, and prioritize critical infrastructure to facilitate risk sensitive planning.
- ❖ Work with the Association of Caribbean States (ACS) within the context of their cooperation initiatives with the Instituto Nacional de Estadística y Geografía (INEGI) of Mexico to complement the existing information platform to take it the required level of detail.
- ❖ Develop the Caribbean wide Disaster Resistant Business (DRB) Toolkit for Small and Medium Enterprises (SMEs) and Non-governmental Organizations (NGOs)/non-profits.

Table 1. Regional Road Map for Urban Seismic Risk Management

<u>Thematic Area</u>	<u>Status</u>	<u>Recommendations</u>	<u>Timelines</u>	<u>Funding Opportunities</u>	<u>Follow up (lead organization)</u>
1. Risk Governance⁵					
1.1. Regional institutional and policy arrangements for seismic risk	The nature and scale of seismic risk in the Caribbean is not fully appreciated by governments in the region. For each country earthquake disasters have been and will continue to be infrequent. Coupled with the fact that destructive events usually impact a small area of an extensive geographical region comprised of more than 17 sovereign states, losses are usually borne by only a small fraction of the regional population. This has provided little impetus to create region-specific institutions and policy arrangement to manage seismic risk	1. Establishment of a Chair at a credible university within the region to coordinate earthquake engineering research specific to the region.	2-3 years	Energy companies, regional insurance companies can be approached to provide funding to establish this chair Use a percentage of the monies obtained from national lotteries to fund scientific research on natural hazards	CDEMA, Universities; Research Institutions
		2. Establishment of a special research fund (akin to the National Science Foundation (NSF)) to finance region specific earthquake risk studies.	2-5 years		
		3. Establishment of a Catastrophe Bond or similar instrument/ revisit an existing mechanism such as the CDEMA emergency relief grant to consider catastrophic seismic impacts on urban centres.	5-15 years		
		4. Alternatively, Caribbean Catastrophe Risk Insurance Facility (CCRIF) should be leveraged to provide risk finance solutions			
		5. Establish a sustainability fund to finance the Regional Disaster Response Support Mechanism			

⁵ Identify the specific nature of the vulnerability and map against the respective institution(s); Build capacities and strengthen participation in disaster risk management; Ensure the consistency of data and disaster risk information among the stakeholders

	With respect to financial aspect of above problem, the CCRIF provides an adequate platform to build on.	Developing a disaster risk management framework (institutional arrangements at a country level) linked to fiscal policy 6. Implementing above framework 7. Work on a governance framework that links disaster risk management with fiscal policy.	Immediate 5 years 5-15 years		CCRIF, CDEMA
2. Understanding Urban Seismic Risk					
Geologic Data Inventory	Some areas have been mapped moderately in terms of geology, and some areas require new mapping; some countries may have restricted maps.	Evaluate status and availability of geologic maps for urban seismic risk.	1 year	---	Regional Universities e.g. UWI, SRC, CDEMA (CRIS) National Bodies responsible for geologic mapping.
Seismic catalogue	Different agencies responsible for sub-regional areas have maintained updated catalogues but only for their specific region of responsibility; no mechanism exists for doing similar updates at a regional scale	Update and maintain a Homogeneous Regional Seismic Catalogue (historical and instrumental)	1-3 years	Large international agencies	Regional Universities e.g. UWI, SRC, CDEMA (CRIS) National Bodies responsible for geologic mapping
Fault inventory (onshore and offshore)	Does not exist	National and regional entities to generate inventories	1-3 years	National and Regional entities	Regional Universities e.g. UWI, SRC, CDEMA (CRIS) National/regional Bodies
Geospatial Data (DEMs, etc.)	Assess availability of geospatial data (e.g. geographic maps, DEMs, aerial photographs, satellite imagery, LIDAR, etc.)	Establish minimum useful geospatial databases (e.g. geographic maps, Digital Elevation Models, aerial photographs, satellite	1-3 years	National/Regional entities (collection involving larger	Regional Universities e.g. UWI, SRC, CDEMA (CRIS)

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		imagery, LIDAR, etc.)		international agencies)	National/regional Bodies
Seismic Monitoring GPS Weak motion Strong motion Background Noise	Assessment of geophysical monitoring in the region.	Establish national networks where they are lacking	1-3 years	National/regional level (International for new networks/upgrades)	National/regional bodies
Hazard mapping	Updates of seismic hazard maps (including an integrated regional map) and other seismic provisions have no guaranteed source of funding. As a consequence maps are often outdated. Even the leading regional institutions do not have the full expertise to carry out major assessments.	With the adoption of the International Building Code (IBC) by Council of Caribbean Engineering Organisations (CCEO) it is necessary to keep revision of the maps more closely in sync with the IBC. IBC is based on American Society of Civil Engineers (ASCE) 7 for earthquake-resistant design which has a 5 or more year cycle)	6-12 years - revisions should be done every 6-12 years.	A minimum of USD200,000/annum is needed to fund activities to update regional hazard maps and provisions at least every five years.	Seismic Research Entities (Example. SRC, EU Centre, Institute Physique du Globe de Paris (IPGP), Isabela State University (ISU), Bureau de Recherches Géologiques et Minières (BRGM), Centro Nacional de Investigaciones Sismológicas (CENAI), United States Geological Survey (USGS)

		<p>Establish a standing mechanism to ensure regular updating of seismic hazard maps</p> <p>Establish a trust fund that will be provide the funding needed to routinely update seismic hazard maps; for research and development with a percentage designated for the local level</p>		<p>Approach the regional banking sector and insurance institutions to provide seed funding for the trust</p>	
	<p>Issues of appropriate scales of mapping remain. The current map scales do not allow for effective planning and decision making at the local level.</p>	<p>Update and improve hazard maps (aerial photography, terrain, etc.) and risk profiles for urban centres at the appropriate planning scales for local consideration of the hazard.</p>	<p>1-3 years</p>	<p>Regional scale - look for international agency support. Intra ACP/EU 11</p> <p>Caribbean Development Bank (CDB) held Intra ACP/EU 10</p> <p>ACS</p>	<p>CDEMA/National Statistical Data Management Unit (SDMU)/SRC</p>
		<p>Have a standard methodology of qualification and mapping of hazards at the regional level and means of operationalization and integration of this knowledge into urban planning: the methodological Guide of reduction of risk in Haiti could serve as basis</p>			
Vulnerability and Risk assessment	<p>There is no regional programme to undertake risk and vulnerability assessment. Risk and vulnerability assessments for the earthquake risk are inadequate as they stand. IADB, EU and</p>	<p>Undertake risk and vulnerability assessment of seismic hazard in all major urban areas in the region.</p> <p>Establish a standard</p>	<p>Starting immediately and extending over the next 15 years with 5 year review</p>	<p>Governments, Grants from Lending Agencies (local, regional and international) and Donor Agencies;</p>	<p>Engineering Research and Seismic Research entities;</p> <p>CDEMA/NDO,</p>

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<p>WB have funded a few investigations and some training throughout the region but a much greater effort is needed. The SRC in collaboration with GEM tried to establish a regional program but due to lack of funding this initiative was not sustained.</p> <p>The most extensive work in this area has been done through PAHO during the past 30 years</p> <p>Concrete applications of assessment diagnostics of the structural vulnerability of existing critical buildings (hospitals, administrations, schools, places of worship, retirement homes, hotels, etc.) to earthquakes have been done in Haiti (North) and Santo Domingo (capital)</p> <p>There is a current DfID-funded, PAHO-executed project carrying out a first-stage vulnerability assessment of most healthcare facilities in 7 Caribbean states.</p>	<p>mechanism/methodology for undertaking seismic risk and vulnerability assessments.</p> <p>Provide support for institutions undertaking risk and vulnerability assessments (training, modelling socio-economic losses to guide prevention policies and prioritize mitigation actions, retrofitting of existing buildings)</p> <p>Encourage collaborative research on seismic risk and vulnerability assessment in the region.</p> <p>Existing mechanisms such as the CDEMA Regional Technical Working Group on Risk Assessment can be supported in its efforts to advance this area through the development of a regional benchmark and undertaking of audits to determine existing capacity and gaps.</p> <p>Generalization of assessment diagnostics of the structural vulnerability of existing critical buildings (hospitals, administrations, schools, places of worship, retirement homes,..., hotels, etc.) to earthquakes using applications that have been done in Haiti (North) and Santo Domingo (capital) as a basis.</p> <p>Creation of a partnership between scientists, institutions, policymakers, public and citizens</p>	<p>period.</p>	<p>Development funding</p> <p>Intra ACP EU 11 and CDB Held Intra ACP 10 Funds</p>	<p>Planning and Statistics Dept. Ministry of Public Works, Transport and Communications (MTPTC)/Haiti</p> <p>CCEO</p>
<p>3. Mitigation and Preparedness</p>				

Risk Sensitive Planning (based on risk information) – e.g. micro zonation⁶	<p>Micro zonation information exists for only a few cities (Kingston, Port of Spain and San Fernando, Santo Domingo, Fort de France, Pointe a Pitre, Port of Prince and Cap-Hatien. Assessments are largely project-funded. Cities lack the density of Strong Motion instruments that can provide data to make the maps more suitable for land use planning decisions and engineering applications.</p> <p>CDB has recently updated its Sourcebook: Integration of Natural Hazards into the Environmental Impact Assessment (EIA) Process</p> <p>Note: An EIA is fundamentally different from a Natural Hazards Impact Assessment (NHIA)</p>	<p>Project Specific - All new investment projects (public and private) should be subject to the application of a natural hazard study (Seismic focus included)</p> <ul style="list-style-type: none"> ▪ The development application process should include this study ▪ For all existing critical infrastructure sites, specific micro-zonation studies must be conducted <p>In the event the cost to do micro-zonation studies is prohibitive, then require site specific studies</p>	5 – 15 years	<p>Government Public Sector Investment Programme (PSIP). Private Sector (developers and Industry)</p> <p>Government PSIP/ Development Funding CDB</p>	<p>Seismic Research Entities (Example. SRC, EUCENTRE, IPGP, ISU and BRGM)</p> <p>Environmental Management, Planning, Seismic Research Entities CDEMA, Civil Protection Authorities (CPA)</p>
	<p>Several dispersed studies post-earthquake 2010 that need to be consolidated & updated.</p>	<ol style="list-style-type: none"> 1. Organize training workshop for NHIA consultants (earthquake engineer) to improve competence in performing seismic engineering risk analysis. 2. Review planning legislation to incorporate NHIA as a consideration in the approval process 	1-3 years	<p>Regional and international dev. Banks and funding agencies</p>	CDEMA,DPC
Building Codes and Standards (guided by earthquake engineering standards)	<p>The CCEO has adopted the use of the IBC as the basis for its CADs since 2000. The Commonwealth Caribbean is required to prepare an Application Document (AD) to complement the IBC. It is intended to</p>	<p>Appoint a competent authority to advance the Regional Building Standards/Codes</p>	<p>2-3 years to develop the standards. 10-20+ years for implementation.</p>	<p>Regional and International Development banks. Mortgage Investment Banks.</p>	<p>Council of Caribbean Engineering Organizations (CCEO), Association of Commonwealth</p>

⁶ Land-zoning and management of urban growth; risk-aware planning, design and implementation of new buildings, neighbourhoods and infrastructure, using innovative or existing/traditional techniques as applicable; systemic and specific vulnerabilities mapping; Mainstream resilience into ongoing urban master plan updates and sectoral strategies

	<p>have one Caribbean Application Document (CAD) for the Commonwealth Caribbean. Attempts were made to prepare a CAD via the Caribbean Regional Building Standards Project (funded by CDB and executed by CROSQ) but this initiative has stalled. Two countries (Jamaica and Trinidad) have attempted to develop their own AD and make the use of the IBC legally enforceable but so far have been unsuccessful. Jamaica has completed its document but awaits Governments “approval”. Trinidad is at a very early stage in its programme.</p>	<p>Engage the major development banks in the adoption of the regional building codes – Major banks to require building standards in their lending requirements</p> <p>French Model for enforcement of building codes should be adapted and adopted in all Caribbean territories</p>	<p>1 year</p> <p>3-5 years</p>		<p>Societies of Architects in the Caribbean (ACSAC), Caribbean Regional Organization for Standards and Quality (CROSQ), CDB, International Development Banks, National Governments</p>
Seismic Risk Preparedness Plans⁷	<p>Some work has been done in terms of establishment of regional standards for the preparation of tsunami inundation maps and development of earthquake contingency plans. There are also ongoing efforts to establish a Tsunami Warning System for the Caribbean.</p>	<p>Enhance the capacity of at least two (2) regional monitoring/research institutions to function as a Tsunami Service Provider</p> <p>Promote the use and enhancement of national earthquake contingency plans</p>	<p>Immediate and into the long term.</p>	<p>Government PSIP/Grants</p>	<p>Inter-governmental Oceanic Commission (IOC), SRC, ISU</p>
Seismic Retrofit and Earthquake Engineering	<p>The United Kingdom Department for International Development (DfID) is funding the retrofitting of 50 hospitals/health Centres in the Windward Islands, Guyana, Jamaica and Belize. DfID is funding the project which is scheduled to end in 2020. It is being executed by PAHO.</p>	<p>Replicate the initiatives of the health sector in social and infrastructure sectors</p>	<p>1-10 years</p>	<p>Development Funding and Private Sector Investments</p>	<p>Planning Ministries of Government and National Disaster Offices (NDOs)</p>
4. Public Education and Awareness					

⁷ <http://www.conservation.org/about/gef/Documents/NDVI/151007-One-Step-CEO-Approval-9163-NDVI.pdf>

Public Awareness and Education ⁸	<p>Regional - Training course in seismotectonics, earthquakes geology and disaster management</p> <p>Regional - draft curriculum on earthquake and tsunami for UWI Master Program in disaster reduction.</p> <p>The SRC Education and Outreach Program comprises: Students outreach, stakeholder meetings, public awareness campaigns, special projects and social media. This program would benefit from additional resources and increased number of engagements in the some territories. The centre also produces information material on various risk themes.</p>	<p>Increase the level of engagements in territories that do not currently have annual engagements.</p> <p>Periodic featuring of urban seismic risk within the region’s premiere Disaster Management Conference – The Caribbean Conference on Comprehensive Disaster Management</p> <p>Note:</p> <ol style="list-style-type: none"> 1. Specific target groups need to aimed at: <ol style="list-style-type: none"> a. Politicians/Senior decision-makers. Ministers of Finance/Works etc. as they make the funding decisions and build the buildings b. Education – Schools- Primary & Secondary/ University/PTA/Teachers c. General Public 2. Peer to peer exchanges throughout the region to assist in the passing on of best practices 	<p>Next 2-3 years</p> <p>Next 2-4 years</p>	<p>Grants from stakeholders and for special projects</p> <p>Various development partners</p>	<p>SRC/CDEMA, National Disaster Organizations</p> <p>CDEMA; SRC</p>
	<p>The current state of public awareness and education in the region is fragmented. National offices use a multi-hazard approach without much hazard specific focus separately)</p>	<p>Develop a multi-hazard, multi-pronged public awareness strategy for the region. That is adaptable at the national level, but allows for regional coordination.</p> <p>The current national level public awareness should continue</p>	<p>2-3 years</p> <p>Immediate – ongoing</p>	<p>CDEMA IFRC, SRC</p>	<p>NDO</p>

⁸ Impacts of environmental change and degradation of ecosystem on disaster risk; Promote better management of critical ecosystems to strengthen resilience to disaster (may be relevant for tsunamis)

	Develop a region wide curriculum for schools in Disaster Risk Management.	2-3 years		
	Implement the UNISDR Comprehensive School Safety Forum throughout the region with a view to harmonization of approaches to school safety. Include high level advocacy for this approach at the CARICOM and OECS Ministers of Education level	1-2 years	CDEMA Council CDM Strategy	Inter-American Development Bank (IDB) WB CDB CCRIF
	Multi-pronged approach to building and construction engineering. Develop regulatory framework/standards that can be applied regionally but adapted at the national level to suit the needs. School-building guidelines.	5-10 years		
	Aid-agencies through their monitoring and evaluation of their projects need to ensure that the projects are built to regional standard	Immediate		CDB, IDB, WB, DfID, EU, DFAFT

Emergency drills	<p>– A CDEMA Standard for Exercise Planning, Execution and Evaluation: Manual for Tsunami and Earthquake Drills⁹ has been developed</p> <p>LANTEX (regional Tsunami Simulation Exercise) is conducted annually. Each year a local and a regional tsunami scenario are scripted.</p> <p>Earthquake drills are not conducted routinely in most of the islands of the Caribbean.</p>	<p>Earthquake drills and simulation exercises should be integrated into national exercise programmes and conducted routinely in schools and at the local level</p>	<p>Immediate</p>	<p>Local Government and Private Sector</p>	<p>Local Disaster Functionaries</p>
5. Response, Recovery and Reconstruction					
Seismic Response	<p>Many Countries e.g. Trinidad and Tobago have Earthquake Response plans. Several require review. CDEMA has developed a Model Earthquake Response Plan and this should be utilized in the review of the National Seismic Response Plans</p> <p>CDEMA developed the Model Earthquake Contingency Plan (2011);</p> <p>An Earthquake annex to the Regional Coordination Plan exists.</p> <p>National Contingency Plans for Oil Spill and Chemicals, Earthquake and Tsunami exist for Trinidad and Tobago</p>	<p>All National Seismic Response Plans to be updated and exercised. Updated plans should incorporate scientific information and should assume a maximum credible earthquake scenario or a worst case scenario.</p>	<p>1-3 years</p>	<p>CDF and CDEMA Emergency Operations Specialist</p>	<p>NDOs/CDEMA</p>

⁹ Product shared in the Regional Seismic and Tsunami Risk Workshop, 2015

	Limited existing capacities for seismic response	Build SAR and specialized emergency response capacity of local emergency response team (including community volunteer teams who also serve as first responders) through training and adequate resourcing. Promote the establishment of trained and adequately equipped SAR teams in countries (Recommended to have one team for small islands and multiple teams for larger countries)	1-3 years	ECHO, United States Agency for International Development/ Office of U.S. Foreign Disaster Assistance (USAID/OFDA) Department of Foreign Affairs, Trade and Development (DFAFT)-Canada, International Search and Rescue Advisory Group (INSARAG), CDEMA, Japan International Cooperation Agency (JICA), White Helmets (Argentina)	CDEMA/NDOs PAHO/WHO (health emergencies)
	Limited capacities across countries for conducting quick post assessments or “building triaging” in the aftermath of a seismic events.	Develop capacities (train individuals) for the conduct of quick assessments or “building triaging” in the immediate aftermath of a seismic event to determine which ones are safe for occupation	1 -3 years	Economic Commission for Latin America and the Caribbean (ECLAC) USAID WB	NDOs
		Promote the development of crisis communication strategies for the dissemination of credible information to the public in the aftermath of seismic events Establish an information sharing platform for dissemination of accurate/reliable information post seismic events.	1 -3 years	ECHO WB USAID	NDOs
Reconstruction and	Often times, temporary/quick fixes are	Promote rehabilitation and reconstruction	Continuous	DFID	PAHO (Safe Hospitals)

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rehabilitation (waste management included)	offered during the recovery/rehabilitation stages which inevitably remain as permanent solutions.	activities in-keeping with existing/codes in the aftermath of disasters (instead of facilitating temporary fixes which ultimately become permanent. Design buildings to be earthquake resistant. Promote seismic retrofitting of existing vulnerable buildings Promote Housing Quality Insurance		WB	Engineering Associations CDEMA
6. Risk Financing and Business Continuity Planning					
Risk financing and transfer	The Caribbean Catastrophe Risk Insurance Facility provides parametric insurance for regional Governments	Enhancement of existing risk transfer mechanisms to give consideration to impacts of seismic activity in urban areas. Need to examine approach used by Mexico in the creation of the FONDEN and FIPREDEN. Also national level Catastrophe/Disaster funds			CDEMA, National Governments
		Contact the government of Mexico to help in developing to institutional framework mentioned above	Immediate		CDEMA, National Governments
		Explore how CCRIF can support CDEMA in risk financing	Immediate		CDEMA
Business Continuity Planning	Countries of the region are in early stages of BCP planning.	Develop the Caribbean wide Business Continuity Planning Toolkit for SMEs and NGOs/non-profits	1 year	Identify vested stakeholders (insurance companies, banks, corporate entities, aid agencies, government, diaspora, chambers of commerce)	CDEMA, Caribbean Chambers of Commerce

	Determine appropriate training measures. (multi-level trainings-drills, high level, etc.)	Immediate	Donor Agencies e.g. USAID/OFDA	CDEMA, Caribbean Chambers of Commerce
	Develop public private partnerships to support the development of the tool	Immediate		Caribbean Chambers of Commerce, CDEMA, AGERCA-Permanent Secretariat of Risk Management and disasters (SPGRD)

Annex 1. Organisational Roles for the Regional Roadmap for Urban Seismic Risk Management in the Caribbean

This annex contains roles that organisations intend to play towards the coordination, implementation, monitoring and reporting on the Regional Roadmap for Urban Seismic Risk Management in the Caribbean. These organisations represent private sector education, disaster risk management for private sector, the seismic scientific community, engineering and regional disaster risk management. Footnotes also provide an indication of the wider applicability of roles identified by the organisations.

1. Caribbean Disaster Emergency Management Agency¹⁰

	Coordination	Monitoring	Reporting
Risk Governance	The Regional Technical Working Group (RTWG) and the Physical and Environmental Planning Sector Sub-Committee (PEPSSC) of the CDEMA system coordinate among the agencies engaged in these respective groupings, plan and provide reports from the sector on work undertaken in relation to the CDM Strategy;	Monitoring will occur through the application of the CDM Audit that is coordinated through the CDEMA CU	Reporting against sector plans is undertaken by the RTWG; and PEPSSC by the sector lead of the Coordination and Harmonisation Council
Understanding Urban Seismic Risk			
Mitigation and Preparedness			
Response, Recovery and Reconstruction			
Public Awareness and Education			
Risk finance and transfer; Business Continuity Planning			

¹⁰ National Disaster Management Systems, National Disaster Offices, member organisations of the Regional Technical Working Group, the Technical Advisory Committee and the Physical and Environmental Planning Sector Sub-Committee (PEPSSC) all have roles related to those indicated by CDEMA.

2. Fondation Haitienne de l'Enseignement Prive - FONHEP¹¹

	Coordination	Implementation	Monitoring	Reporting
Response, Recovery and Reconstruction		<ul style="list-style-type: none"> Psychological support to help the victims regain their strengths. Contribute to the training of construction workers and the reconstruction of schools. 	<ul style="list-style-type: none"> Support the realization of research at schools level to evaluate the level of impact. Research the number of construction workers trained in each department. 	<ul style="list-style-type: none"> Preparation of reports with data on the state of communities following the impact of disasters. Maintain a database of construction workers being trained in the country.
Public Awareness and Education	<ul style="list-style-type: none"> Coordinate the training activities in the sectors of the network. 	<ul style="list-style-type: none"> Contribute in raising awareness in school communities, with emphasis on school directors. 	<ul style="list-style-type: none"> Research the level of knowledge at community level of the seismic risks before a disaster, and on their behaviour following a disaster. 	<ul style="list-style-type: none"> Prepare a report on the awareness and training activities.

3. Alliance for Risk Management and Business Continuity - AGERCA¹²

	Coordination	Implementation	Monitoring	Reporting
Public Awareness and Education		<ul style="list-style-type: none"> Work with the National Disaster Management Agency (NDMA) to develop the standards for vocational and professional training adapted for local communities' needs. It will then run the trainings with the DPC at local businesses. 	<ul style="list-style-type: none"> Survey/Questionnaire on the effectiveness of the training will be given following sessions to get feedback on the effectiveness of training. 	<ul style="list-style-type: none"> Results of the survey/questionnaire will be shared with the Public Awareness and Education Committee and the NDMA.
Risk finance and transfer; Business Continuity Planning	<ul style="list-style-type: none"> Coordinate between the identified private critical infrastructures and the 	<ul style="list-style-type: none"> Lead the development of the DRB toolkit and offer assistance and training on the preparation of the plans to businesses 	<ul style="list-style-type: none"> Monitoring can occur when business continuity plans (BCP) are tested against disaster 	<ul style="list-style-type: none"> The information will be shared with the national system including the NDMA

¹¹ Private and public educational entities at national and regional levels may also contribute as outline by FONHEP.

¹² National and regional disaster management agencies engaging the private sector can support the areas highlighted by AGERCA.

	Coordination	Implementation	Monitoring	Reporting
	national system of disaster risk management (eg. SNGRD). Share their contingency plans.	and institutions.	scenarios and continuity plans. The weaknesses and strengths of the plans will be highlighted to institutions for changes/adjustments to plan.	for information sharing on the level of preparedness in the private sector.

4. Centro Nacional de Sismologia (CNS)¹³

	Coordination	Implementation	Monitoring	Reporting
Understanding Urban Seismic Risk	<ul style="list-style-type: none"> Promote and participate in initiatives to identify institution for hosting a regional seismic catalog. 	<ul style="list-style-type: none"> Provide the local seismic information for the updating of the regional seismic catalog. Provide local earthquake data in real time for the regional seismic network as well as for the tsunami warning center in the region. Make agreements or consortium with other similar institutions of the region (research centers, universities, agencies) to develop research projects on local seismic risk as part of a regional study. 	<ul style="list-style-type: none"> Monitoring is the responsibility of the institution responsible of the maintenance of the catalog. Ensure the continuous flow of data and the responsible institution must verify its reception and notify of any challenges. 	<ul style="list-style-type: none"> Include submissions of data shared with established institution responsible for the catalog in agency reports. Periodically, the institution responsible will prepare a report about the status of the data flow during the period.

¹³ National and Regional Seismic Centres/Units may also engage in activities highlighted by CNS.

5. Caribbean Council of Engineering Organizations¹⁴

	Coordination¹⁵	Monitoring
Risk Governance	Coordinate actions related to standards and codes	Monitor implementation of standards and building codes
Understanding Urban Seismic Risk	Coordinate hazard mapping and vulnerability assessments	Monitor the development of hazard maps and vulnerability assessments
Mitigation and Preparedness	Coordinate among agencies mitigation elements of the regional roadmap	Focus on monitoring mitigation advancements

¹⁴ National and Regional Engineering, Architectural and Constuction Organisations as well as National and Regional Standards Agencies should also contribute to the areas highlighted by the CCEO.

¹⁵ The work to be undertaken in relation to coordination will require funding.